

REMARKS/ARGUMENTS

In view of the foregoing amendments and the following remarks, the applicants respectfully submit that the pending claims are not anticipated under 35 U.S.C. § 102. Accordingly, it is believed that this application is in condition for allowance. **If, however, the Examiner believes that there are any unresolved issues, or believes that some or all of the claims are not in condition for allowance, the applicants respectfully request that the Examiner contact the undersigned to schedule a telephone Examiner Interview before any further actions on the merits.**

The applicants will now address each of the issues raised in the outstanding Office Action.

Objections

The Examiner objected to the drawings under 37 C.F.R. § 1.83(a) for not showing "plural slit pairs". The drawings have been amended to add a drawing illustrating plural slit pairs as Figures 5(A) and 5(B). No new matter has been entered. The new enclosed drawing is supported by the original specification including the following citations : (i) " two **or more** slits formed as to be symmetrical with respect to the axis of the nut, radially penetrate the female thread from the outer periphery of the nut and be located at an axial position on the upper side of the axial center position of the nut body," (pg. 4 lines 3-8); (ii) "two or more slits are formed, but it is possible to form **a greater number of slits** as well by making the bottoms of the slits to be

circular" (pg. 4 lines 10-12); (iii) "a **plurality of slit pairs** are formed at predetermined positions uniformly subtending the circumference" (pg. 10 lines 1-3). In view of the foregoing, it is respectfully requested that the objections to the drawings be withdrawn.

Rejections under 35 U.S.C. § 102

Claims 1-14, 16 and 17 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 1,263,217 ("the Fine patent"). The applicants respectfully request that the Examiner reconsider and withdraw this ground for rejection in view of the following.

Claim 1 (as amended) recites that the nut body has **more than two slits**. The Fine patent does not disclose a nut body with more than two slits. For at least this reason, claim 1 (as amended) is not anticipated by the Fine patent.

Claim 2 (as amended) recites a nut body having an upper portion and a lower portion, wherein **the maximum outer diameter of the upper portion is less than the minimum outer diameter of the lower portion**. The Fine patent does not disclose nuts with this feature. This feature of forming a nut body with a smaller size upper portion than the lower portion, offers several advantages over the Fine patent uniform nut. For example, the larger lower size portion of the nut can be formed, e.g., in a hexagon outer pattern, to accept a tool for tightening and loosening the nut, and the upper portion including the locking feature can be formed, e.g., with a smooth circular outer pattern, to prevent engagement,

either on purpose or accidentally, by such a tool. When the tool is applied to the nut with such a feature of the present invention, the tool, e.g., a socket or wrench, will not engage the upper locking portion of the nut including the bent push parts. Consequently, accidental deformation of the push parts and resulting damage to the locking feature from distortion of the plastically deformed push parts by the tool is avoided. However, in the case of a nut constructed in accordance with the Fine patent, e.g., with a same size hexagon pattern outer surface over both upper and lower portions, there is a possibility of damage to the locking mechanism by placement of a socket or wrench on the portion of the nut including the slits and plastically deformed parts. For example, if a socket is used to install the Fine patent nut, the socket walls will typically contact the outer portions of the nut including the plastically deformed locking parts. It is not unusual during part of the assembly or disassembly with a bolt, for the socket to engage only a portion of the nut, e.g., the upper portion, due to an operator not fully seating the socket, due to a slippage of the socket, or due to the bolt bottoming in the socket (e.g., the socket is not deep enough for the bolt/nut combination). Engagement of the upper portion with the plastically deformed locking components and not the lower portion, especially as the nut is tightened securely against a surface or initially broken loose, can result in additional undesirable plastic distortion to the plastically deformed parts resulting in damage and an alteration in the locking characteristics of the nut. In addition, worn or imprecise sockets may result in a tilting of the socket

during assembly or disassembly applying undesirable forces to the plastically deformed portions of the nut damaging the locking feature. If a wrench, such as an open end wrench is used, the operator may inadvertently apply the wrench to the locking section of the nut and damage the plastically deformed locking portion, or the operator may slip during assembly or disassembly and damage the plastically deformed part of the nut.

Another advantage to different size portions of the nut is that for a given weight nut, more material may be concentrated in the lower portion needing higher strength since that portion of the nut is subjected to higher stress levels since it is forced against a stopping surface. Therefore, claim 2 (amended) of the present invention is distinguished over the Fine patent by the feature of the different size portions of the nut as described in claim 2 (amended), and claim 2 (amended) is not anticipated by the Fine patent. Since claims 3(amended), 4(amended), 5 (amended), and 6 (amended) include the features of claim 2 (amended) by virtue of their dependency, they are similarly not anticipated by the Fine patent.

In addition, dependent claim 6 (amended) is not anticipated by the Fine patent for the following additional reason. Claim 6 (as amended) recites an upper portion of the nut body inclusive of the first and second push parts being **circular in plan view shape**. The Fine patent does disclose such a feature. The circular shape is an advantageous shape to select to use to avoid an assembly tool getting caught or snagged on the upper portion of the nut and accidentally damaging the plastically deformed parts used in the locking feature.

Claim 7 (as amended) recites that the nut comprises at least **two pairs of slits** formed at an axial position closer to the second opening and such as to be symmetrical with respect to the axis of the nut and to radially partly penetrate the female thread from the outer periphery of the nut. The Fine patent does not disclose a nut body with at least two pairs of slits. For at least this reason, claim 7 (as amended) is not anticipated by the Fine patent. Since claims 12-14, and claim 16 include the features of claim 7 (amended) by virtue of their dependency, they are similarly not anticipated by the Fine patent.

In addition, dependent claim 12 is further not anticipated by the Fine patent because it recites that an outer periphery of the **second axial part is circular** in shape. This feature is not present in the Fine patent.

In addition, dependent claim 16 is further not anticipated by the Fine patent because it recites a **maximum outer diameter of the second axial part is smaller than a minimum outer diameter of the first axial part**. This feature is not present in the Fine patent.

Claim 8 (as amended) recites a nut with a **second portion of the nut having a smaller maximum outside diameter than a minimum outside diameter of a first portion of the nut**. The Fine patent does not disclose a nut with this feature. Claim 8 (as amended) is not anticipated by the Fine patent for at least the same reasons as described above with respect to claim 2 (as amended).

Claim 9 (as amended) recites a nut that comprises at least **two pairs of slits** formed at an axial position closer to the second opening and such as to be

symmetrical with respect to the axis of the nut. The Fine patent does not disclose a nut body with at least two pairs of slits. For at least this reason, claim 9 (as amended) is not anticipated by the Fine patent.

Claim 10 (original) recites a nut that has **a maximum outer diameter of a second axial part is smaller than the minimum outer diameter of a first axial part**. The Fine patent does not disclose a nut with this feature. Further, claim 10 (original) is not anticipated by the Fine patent for at least the same reasons as described above with respect to claim 2 (as amended).

Claim 11 (original) recites a nut with **a maximum outer diameter of a second axial part set to be smaller than a minimum outer diameter of the first axial part**. The Fine patent does not disclose a nut with this feature. Further, claim 11 (original) is not anticipated by the Fine patent for at least the same reasons as described above with respect to claim 2 (as amended).

Since claim 17 has been canceled, the rejection with respect to claim 17 is moot.

Claims 1-17 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Swiss Patent No. 316,882 ("the Krauchi patent"). The applicants respectfully request that the Examiner reconsider and withdraw this ground of rejection in view of the following.

The Examiner contends that the Krauchi patent discloses the same type of lock nut as described in the present application. This is not correct. The distinguishing features between the claims of the present invention and the Krauchi patent shall be described in detail below.

Claim 1 (as amended) recites a nut body with the more than two slits, the **more than two slits** radially penetrate the female thread from the outer periphery of the nut and are **located on an upper side of an axial center position of the nut body**, the slits defining **push parts**, which have been **bent downward** resulting in plastic deformation. Although the Krauchi patent shows a nut with more than two slits (Figure 5), the more than two slits are not located on an upper side of an axial center position of the nut body. In the Krauchi patent two of the slits are located on the upper side of the axial center position and two of the slits are located on the lower side of the axial center position. In addition, in the Krauchi patent nut, parts are deformed by a radial squeezing or pinching rather than by a downward direction (upper to lower) bending as recited in claim 1 (amended). More specifically, in the Krauchi patent, it can be seen in Figure 5 and corresponding Figure 6 that parts 15 have been plastically deformed radially toward the center, e.g., by a squeezing or pinching operation. For at least the reasons stated above, claim 1 (as amended) is not anticipated by the Krauchi patent.

Claim 2 (as amended) recites a nut body having an **upper portion and a lower portion**, wherein the **maximum outer diameter of the upper portion is less than the minimum outer diameter of the lower portion**, the nut body also having two slits formed such as to be symmetrical with respect to the axis of the nut, the two slits radially penetrate the female thread from the outer periphery of the nut, said slits are located in the upper portion of the nut body and are located at an axial position on an upper side of an axial center position of

the nut body, the slits defining **push parts**, which are have been **bent downward** resulting in plastic deformation. The Krauchi patent does not show a nut with different outer diameter upper and lower portions. Although the Krauchi patent shows a nut with two slits (Figure 3), parts are deformed by a radial squeezing or pinching rather than by a downward direction bending (upper to lower direction) as recited in claim 2 (amended). More specifically, in the Krauchi patent, it can be seen in Figure 3 and corresponding Figure 4 that parts 10 have been plastically deformed radially toward the center, e.g., by a squeezing or pinching operation. Note that the gap 8 does not vary as moving from the outside of the nut toward the center of the nut in the Krauchi patent, as is the case with downward bending of push parts. In addition to different physical observable distinguishable differences between downward bending vs radial pinching, the downward bending in accordance with claim 2 (as amended) inherently results in different beneficial locking characteristics for the nut. The Krauchi patent nut of Figure 3 will have plastic deformation caused by radial pinching which may result in a relatively uniform resistance or locking regardless of whether the nut is being screwed on or off. In contrast, the locking feature of the nut of claim 2 (as amended) has a tendency to have different levels of resistance depending upon the direction of rotation. In the case where the nut of claim 2 (amended) is being screwed on, the plastically deformed parts, which have been pushed down, have a tendency to elastically deform so as to slightly open the downwardly bent push parts toward the pre-bending position resulting in a relatively lower level of locking

resistance. However, if the nut begins to screw off or come loose, there is a tendency for the push parts to slightly elastically deform downwardly, thereby reinforcing the locking and providing a relatively higher level of locking resistance. In applications, where the lower portion of the nut is tightened against a surface (e.g., and torqued) it is beneficial for the nut's locking mechanism to provide minimal resistance in the tightening direction so as not to give a false indication that the nut is secured or to interfere with the measurement of the specified torque level. For at least the reasons stated above, claim 2 (as amended) is not anticipated by the Krauchi patent.

Since claims 3 (amended), 4 (amended), 5 (amended), and 6 (amended) include the features of claim 2 (amended) by virtue of their dependency, they are similarly not anticipated by the Fine patent.

In addition dependent claim 4 (amended) is not anticipated by the Krauchi patent for the following additional reason. Claim 4 (as amended) recites a nut wherein a ***width s defines slit gap at the tips of the first and second push parts, the width s is in the range of 0 to 0.5 times the bottom width g of the first and second slits.*** The Krauchi patent does not show nuts with such different gap dimensions, but rather shows nuts with a uniform gap dimension. (See Figure 3, gap 8.)

Dependent claim 6 (amended) is not anticipated by the Fine patent for the following additional reason. Claim 6 (as amended) recites an upper portion of the nut body inclusive of the first and second push parts being ***circular in plan view shape.*** The Krauchi patent does not disclose such a feature.

Claim 7 (as amended) recites a nut having an internal female thread, a first opening from which a male thread to be screwed is inserted, and a second opening, from which the inserted male thread exits; wherein the nut comprises **at least two pairs of slits formed at an axial position closer to the second opening**. Although the Krauchi patent shows two pairs of slits, one pair of slits is formed at an axial position closer to a first end of the nut and the second pair of slits is formed at a different axial position closer to a second end of the nut. (See Figure 5.) For at least the reason stated above, claim 7 (as amended) is not anticipated by the Krauchi patent. Since claims 12-16 include the features of claim 7 (amended) by virtue of their dependency, they are similarly not anticipated by the Krauchi patent.

In addition, dependent claim 12 is further not anticipated by the Krauchi patent because it recites that an outer periphery of the **second axial part is circular** in shape. This feature is not present in the Krauchi patent.

In addition, dependent claim 15 is further not anticipated by the Krauchi patent because it recites a nut, wherein the **at least two pairs of slits are formed at predetermined positions uniformly subtending the circumference**. This feature is not present in the Krauchi patent. Rather, in the Krauchi patent, the two pairs of slits are at the same locations as traveling around the circumference of the nut, one pair above the other pair.

In addition, dependent claim 16 is further not anticipated by the Krauchi patent because it recites a **maximum outer diameter of the second axial part is**

smaller than a minimum outer diameter of the first axial part. This feature is not present in the Krauchi patent.

Claim 8 (as amended) recites a nut having **a second portion of the nut having a smaller maximum outside diameter than a minimum outside diameter of a first portion of the nut, said first portion of the nut being formed to accept a tool used for tightening and loosening the nut.** The Krauchi patent does not show such a distinction in outside diameters, and the Krauchi patent shows a nut formed so that the entire nut may accept a tool for tightening and loosening the nut. Thus, claim 8 (as amended) is not anticipated by the Krauchi patent for at least this reason.

Claim 9 (as amended) recites a nut, wherein the nut comprises **at least two pairs of slits formed at an axial position closer to the second opening** and such as to be symmetrical with respect to the axis of the nut and to radially partly penetrate the female thread from the outer periphery of the nut, a first axial part defined on the first opening side and a second axial part defined on the second opening side bounded by the pairs of slits, and the female thread parts of the first and second axial parts have the same shape parameter, and **the width of the slit increases as moving from the outer periphery toward axis of the nut in the axial direction.** Although the Krauchi patent shows two pairs of slits, one pair of slits is formed at an axial position closer to a first end of the nut and the second pair of slits is formed at a different axial position closer to a second end of the nut. (See Figure 5.) In addition, the Krauchi patent does not show uniform width slits that do not increase as moving from the outer periphery toward the axis of the

nut. (See Fig 5, slits 13.) For at least the reasons stated above claim 9 (as amended) is not anticipated by the Krauchi patent.

Claim 10 (original) recites a nut including a first axial part defined on the first opening side and a second axial part defined on the second opening side bounded by the pair of slits, ... and the **maximum outer diameter of the second axial part is smaller than the minimum outer diameter of the first axial part.** Although the Krauchi patent shows a nut with first and second axial parts, the maximum outer diameter of the second axial part is not smaller than the minimum axial of the first axial part. (See Figures 3 and 4.) For at least the reason stated above, claim 10 (original) is not anticipated by the Krauchi patent.

Claim 11 (original) recites a nut having **a second axial part being plastically deformed to increase the width of the slits toward the axis of the nut;** and the **maximum outer diameter of the second axial part is set to be smaller than the minimum outer diameter of a first axial part.** The Krauchi patent does not show such features. Rather, the Krauchi patent shows uniform slit widths. The Krauchi patent does not show the second axial part with a smaller minimum outer diameter than the minimum outer diameter of the first axial part. (See Figures 3 and 4.) For at least the reasons stated above, claim 11 (original) is not anticipated by the Krauchi patent.

Since claim 17 has been canceled, the rejection with respect to claim 17 is moot.

New claims

Claim 25 is a new independent claim which recites a loosening-proof nut comprising a nut body having a central female thread with a nominal diameter d , the nut body having a hexagonal outer shape, the nut body also having two slits, a first and a second slit, formed such as to be symmetrical with respect to the axis of the nut, the two slits radially penetrate the female thread from the outer periphery of the nut, said slits are located at an axial position on an upper side of an axial center position of the nut body, **each slit cuts through two full faces and two partial faces of the nut body**, the slits define push parts, which have been bent downward resulting in plastic deformation, the push parts consist of a first and a second push part defined in an upper part of the nut body by the first and second slit. Note that, in contrast, in the Fine patent nut and the Krauchi patent two slit nut (See Figure 3.), **each slit cuts through one full face and two partial faces**. For at least this reason, new independent claim 25 is not anticipated by the Fine patent or the Krauchi patent.

Claim 18 depends from independent claim 1 (as amended) and further recites wherein the more than two slits are three slits, spaced 120 degrees apart, and located at an axial position on the upper side of the axial position on the upper side of the axial center position of the nut body, thereby further patentably defining the invention over the Fine and Krauchi patents.

Claim 19 depends from independent claim 1 (as amended) and further recites wherein the more than two slits comprise multiple pairs of slits, thereby further

patentably defining the invention over the Fine and Krauchi patents.

Claim 20 depends from dependent claim 19 and further recites wherein the multiple pairs of slits are located at an axial position on the upper side of the axial center position of the nut body, thereby further patentably defining the invention over the Fine and Krauchi patents.

Claim 21 depends from independent claim 2 (as amended) and further recites wherein a distance b between the bottoms of the first and second slit is in a range of 0.15 to 0.8 times the normal diameter d , thereby further patentably defining the invention over the Fine and Krauchi patents.

Claim 22 depends from independent claim 2 (as amended) and further recites wherein the lower portion of the nut body is one of a hexagon and a square shape as viewed from above, thereby further patentably defining the invention over the Fine and Krauchi patents.

Claim 23 depends from independent claim 2 (as amended) and further recites wherein the lower portion of the nut body is formed to accept a tool used for tightening and loosening the nut, thereby further patentably defining the invention over the Fine and Krauchi patents.

Claim 24 depends from claim 5 (as amended) and further recites wherein the angle is slanted and wherein the angle and slant direction are selected to adjust reaction forces of the first and second push parts thereby further patentably defining the invention over the Fine and Krauchi patents.

Claim 26 depends from claim 4 (as amended) and further recites wherein said plastic deformation and said difference in gap width s and g result in asymmetric retaining tension levels of the locking feature depending upon nut rotation direction thereby further patentably defining the invention over the Fine and Krauchi patents.

Amendments to the Specification and Drawings

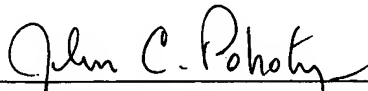
The specification has been amended to correct a number of minor errors and to reference the proposed new Figures. Proposed new Figures 5A-7 have been added to illustrate features in the original set of claims. No new matter has been added.

Conclusion

In view of the foregoing amendments and remarks, the applicants respectfully submit that the pending claims are in condition for allowance. Accordingly, the applicants request that the Examiner pass this application to issue.

Respectfully submitted,

July 19, 2004



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CERTIFICATE OF MAILING under 37 C.F.R. 1.8(a)

I hereby certify that this correspondence is being deposited on **July 19, 2004** with the United States Postal Service as first class mail, with sufficient postage, in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.



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